Journal of Research on the Lepidoptera 6(4):257-262, 1967

1160 W. Orange Grove Ave., Arcadia, California, U.S.A. 91006

STUDIES IN LIFE HISTORIES OF NORTH AMERICAN LEPIDOPTERA
CALIFORNIA ANNAPHILA III

JOHN ADAMS COMSTOCK[1] and CHRISTOPHER HENNE
Del Mar, California and Pearblossom, California

In continuing the life history studies of California Annaphilas we have been fortunate in obtaining information on three species, the early stages and host plants of which have heretofore been unknown. These are *Annaphila lithosina* Hy. Edw., *Annaphila casta* Hy. Edw., and *Annaphila miona* Sm.

ANNAPHILA LITHOSINA Hy. Edw.

This species has been discussed by Rindge and Smith (1952) as one ranging through "northern and central California for which the early stages and foodplant are unknown."

Bauer, Buckett and Gardner observed the ovulation of *lithosina* near the American River, 3.5 mi. east of Auburn, El Dorado Co., Calif., el. 1000' in May, 1967 as recorded by Buckett. He had the larval host plant identified as *Mimulus guttatus* Fisch, ex D. C. He obligingly relayed this information to the associate author, who subsequently located still another colony of this species 6 mi. east of Auburn, Placer Co., el. 2000'. Field work in these two localities produced ova for the following early stage descriptions.

The eggs were found on the under surfaces of the terminal leaves and a few on the flower buds and stems.

Ova were collected in various stages of incubation with the progressive color changes recorded. Three females were observed in the act of ovulation.

EGG. (Fig. 1A)

Ovoid. Width, 0.5 mm.; approximately 0.35 mm. high. Surface covered by approximately 60 ridges arising at base and running toward micropyle, with many pinched out superiorly. The surface is straw-colored when freshly laid, later turning red-brown, and finally translucent gray prior to hatching.

Our figure is tipped slightly forward to show the micropylar area.

The egg under study hatched June 3, 1967.

[1]Research Associate in Entomology of the Los Angeles County Museum of Natural History

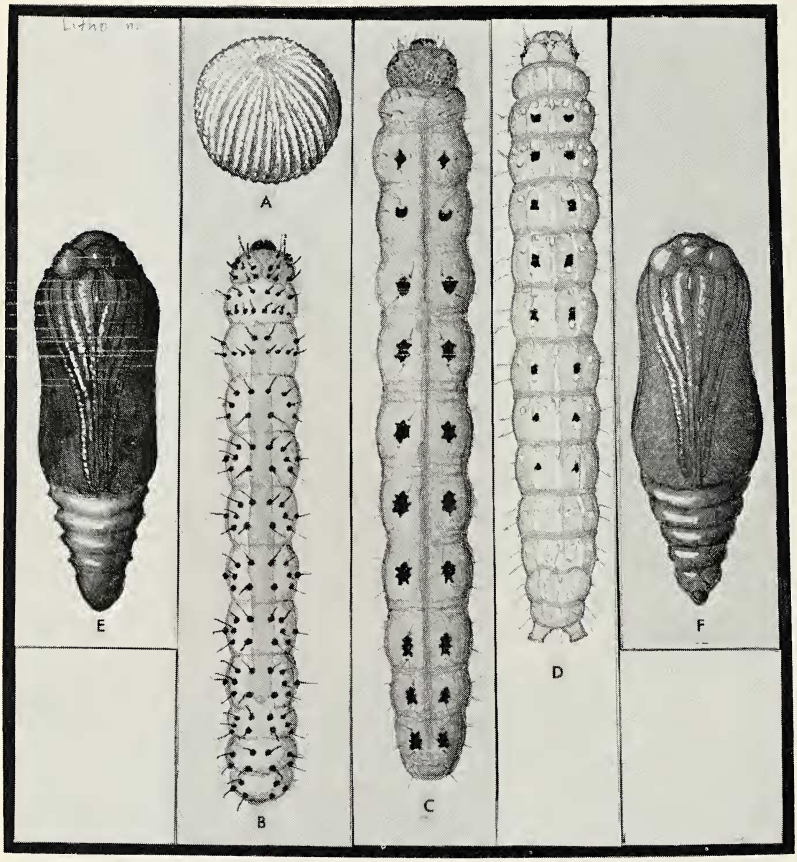

Fig. 1 Early stages of *Annaphila lithosina* and *A. casta*. *A. lithosina*: egg (A), 2nd larval instar (B), final larval instar (C), pupa (E). *A. casta*: final larval instar (D), pupa (F.)

FIRST INSTAR LARVA.

Length, 1.5 mm. Head, jet black. Width approximately 0.25 mm. Antennae translucent. Numerous small hyaline setae on the head which we have not attempted to map.

Body, width 0.2 mm.; cylindrical, translucent. First thoracic segment has a prominent dark cervical shield, with several raised black papillae on it. Second and third segments crossed transversely, each with a row of black papillae bearing long black setae. The remainder of the segments bear raised black papillae in essentially the same pattern and positions as with the second instar. Legs, darkest on tips, grading to body color proximally.

SECOND INSTAR LARVA. (Fig. 1B)

Length, 5.5 mm. Head width approximately 0.3 mm.; color, dull yellow-green, with numerous raised black papillae, each bearing a short straight seta; mandibles and ocelli, black.

Body, first segment pale yellow to white, crossed transversely by two rows of raised black papillae, most if not all of which bear short black setae. This, and most if not all of which bear short black setae. This, and most of the other segments wider than head. From the 2nd to 8th segments there is a longitudinal greenish area or band, suggestive of a full alimentary subsurface canal filled with bright green vegetation. The lower half of the body and the last three caudal segments are a translucent white. The typical body segment has two transverse rows of raised black papillae, each having moderately long black setae. Legs, soiled yellow on distal segments grading into translucent white proximally. Prolegs similarly colored.

FINAL INSTAR LARVA. (Fig. 1C)

Length, 24 mm. Head, width 1.6 mm. Tips of ocelli, yellow-green; tips of mandibles black. Numerous dark brown spots occur over the crown. Setae, translucent, some apparently arising from brown papillae or spots. Antennae, white.

Body, ground color green. A clearly definable longitudinal gray stripe runs from 2nd thoracic segment to cauda. A similar, though less well defined stripe runs suprastigmatally. Dorsolaterally a row of large black spots runs from 2nd thoracic to 11th segments, one to a segment on each side.

There may be some variation in the number of these spots, particularly if they occur on the penultimate instar.

Prior to pupation the larvae becomes a deep red-brown.

PUPA. (Fig. 1E)

Length, 10.5 mm.; greatest width through center 3.75 mm.

Length from cephalic tip to wing margins, 7 mm.; maxillae terminating 9.5 mm short of wing margins; antennae extending to approximately 1 mm. from distal edge of wing.

The head; appendages, eyes and wings, brownish-black, until the time of hatching when they become black. Their texture is finely rugose. Eyes relatively large. The dorsal portion of thorax and all abdominal segments are brown, and their surface texture smooth and glistening. Spiracles, black, their tips slightly protruding.

There are no spines, hooklets, or protruding structures on the cremaster.

ANNAPHILA CASTA Hy. Edw.

This rare noctuid ranges in certain restricted localities of northern California and southern Oregon in areas in association with marshy meadows and clearings, occurring within the coastal redwood and other coniferous forests.

Our examples were collected in the field, on the under side of leaves of young *Mimulus moschatus* Dougl. ex Lindl. at Plantation, Sonoma Co., Calif., el. 800', May 15, 1967.

Unfortunately neither a detailed structural study of the ova was made at that time nor a description and illustration of the first instar larva. However, a few brief notes were made on these two stages that might prove helpful for the continuation of life history studies on this species. They are as follows:

The ova collected in the field were found on the under side of the leaves of young *Mimulus moschatus* plants. They were deposited singly, usually only one to a leaf, but in two cases, three to a leaf were found. The number of ova per leaf is probably dependent upon the relationship of the number of ovipositing females to the number of plants available.

The ova are seemingly greatly protected by the rather heavy pilose structure on the under surface of the *Mimulus* leaves. Care has been taken by the female to secure them to the *Mimulus* leaves, in close proximity to the intersection of the leaf veins. The egg is pale yellow when freshly laid, later turning to a dark gray prior to hatching.

A casual examination of the young larvae showed them to be of light coloration, with dark heads and setae. They were feeding in the rearing cage on the under surface of the leaves in the central section and skeletonizing them between the veins. Seemingly there was a light webbing over the feeding area, as observed without the aid of a lens, and the larvae were quite

active when examined. It was considered important not to disturb them at this stage of development.

INTERMEDIATE INSTAR LARVA.

Measurements were not determined, as the larva under study was in pre-molt stage, and it was considered inadvisable to disturb the specimen.

Ground color, pale green with a lighter mottling and whitish punctations throughout surface body, similar to those more carefully described in the last instar. The only distinguishing markings are light, diagonally placed subdorsal punctations (2 pair per segment) and a fine light dorsal line. A suggestion of the curved dark dashes on the head is present.

Note: One out of eight larval specimens contained small black subdorsal spots (one pair per segment, but lacking on first three segments), seven in number, and including the pair of diagonally placed whitish punctations present on later instars.

FINAL INSTAR LARVA. (Fig. 1D)

Length, 12-20 mm., width, 3 mm.

Head width, 2 mm. Shining green with brownish cast. Ocelli, black; antennae pale yellow-green; front spotted brown; mandible dull green. An inward curved brownish-black dash runs on both sides of the head on dorsal surface, and continues laterally the width of the cervical shield.

Body, subcylindrical, tapering abruptly at caudal extremity where the body width is somewhat wider, and also gradually tapering to a rather flat head. The body is also considerably more robust and more uniform in width throughout than that of *lithosina,* which has an obvious taper from head to cauda.

Ground color, yellowish green with minute lighter mottling over body surface as seen under a lens. A narrow yellowish dorsal band appears running the length of the body. Minute yellowish-white punctations occur laterally, and another series appears below the infrastigmatal line, and still another series of twin whitish dots, or punctations, are placed diagonally below these. Dorsal markings are very distinctive. A series of large, black semiquadrate irregular spots occur in the subdorsal region, eight to ten pairs in number (two per segment). A whitish spot occurs on one of the diagonally placed pair of punctations and is surmounted by a short colorless seta. This is included in each of these large black spots, occurring posteriorly on these from segments 3-10, anteriorly on segments 1-2. The caudal segment

contains a smaller black spot, centered by a whitish somewhat raised punctation.

As an experiment, two last instar *Annaphila casta* larvae were placed on a *Mimulus guttatus* plant, the native host of *Annaphila lithosina*, and it was found that they readily accepted this as a substitute for *Mimulus moschatus*.

One of the specimens under study was beginning to develop slight brownish coloration and had completed feeding. This undoubtedly was prepupal behavior, so it was placed in a rearing cage with a complete ecological environment typical (as far as possible) of the species natural environment, including soil, redwood bark and partially decomposed wood. This larva and seven additional specimens were found to enter the wood and excavate a cell for pupation, utilizing chewed wood particles cemented together as an outer covering, to form a cocoon.

PUPA (Fig. 1F)

Length, 11 mm. Greatest width through center 4.5 mm. Form similar to that of *lithosina* in many respects. Maxillae terminating at wing margins; antennae terminating 0.05 mm. short thereof; cremaster ending in a prominent round nodule, without spines or hooklets; spiracles concolorous with body, their surfaces not protruding.

The surface of head, thorax and wings slightly more rugose than that of *lithosina*. Abdominal segments glistening.

Color of the single pupa observed showed head, appendages, thorax, and wing cases nearly black with a brownish tinge. Abdominal segments red-brown.

ANNAPHILA MIONA J. B.. Smith

The field observations given us by Oakley Shields, who observed a female *miona* ovipositing on *Mimulus moschatus* Dougl., at Mather, Tuolumne Co., Calif., el. 4600', were a great help to us in obtaining material for our records on *Annaphila lithosina* and *Annaphila casta*.

Unfortunately we were not able to obtain ova or larvae of *miona* but intend to complete this study in a future publication.

LITERATURE CITED

JOHN STEPHEN BUCKETT, Discovery of a Larval Hostplant for *Annaphila lithosina* with Notes on the Species, (Noctuidae; Amphipyrinae), *Jouranl of Research on the Lepidoptera,* 5:262-264, 1966.

FREDERICK H. RINDGE and CLAUDE I. SMITH. 1952. A Revision of the Genus Annaphila, Grote. (Lepidoptera, Phalaenidae) *Bull. Am. Mus. Nat. Hist.* 98 (3):.